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Alexander Star

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O'Melveny & Myers LLP

IP&T Calendar Department L.A.-1118

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Los Angeles, CA 90071-2899

EXAMINER

RAO, SHRINIVAS H

ART UNIT

PAPER NUMBER

2814

MAIL DATE

DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/656,898

Applicant(s)

STAR ET AL.

Examiner

STEVEN H. RAO

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Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-10 and 19-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-10 and 19-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/S508)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

Response to Amendment

Applicants' amendment filed on November 07, 2007 has been entered and forwarded to the examiner on November 14, 2007.

Therefore claim 1 as amended by the amendment and claims 2-10 and 19-20 as previously recited and currently newly added claim 21 are currently pending in the Application.

Claims 11 to 18 have been cancelled.

Content of Specification

Applicant is required to provide with the next response a list of all Applications by the same inventors and inventions subject to assignment to the same entity at the time of the invention relating to the to the same matter and further cite any herein by a IDS any references pertinent to instant application any references cited in these Applications. See 37 CFR 1.56 etc,

Information Disclosure Statement

No further IDSs after the one filed on July 02, 2004 (previously considered and initialed 892 mailed to applicants') have been filed in this case.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-8, 11, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dai (U.S. Patent No. 6,258,020, herein after Dai) and in view of Gardner (U.S. Patent No. 6,111,280, herein after Gardner) both previously applied.

With respect to claim 1 Dai teaches at least from figs. 2 and 6 a nanostructure sensor for sensing a target species, comprising:
at least one molecular nanostructure comprising at least one carbon nanotube (20) ;at least two conducting elements(23) in electrical communication with the at least one nanostructure (20)

The recitation " so as to define a conduction path including the at least one nanotube " a gate electrode disposed and configured to apply a selectable voltage so as to electrically influence a conductivity of the at least one nanotube;" is taken to be not a positive limitation but only requires the ability to so perform. This recitation does not constitute a limitation in any patentable sense and therefore cannot be given patentable weight.

a gate electrode disposed (Dai 23 See column 4, lines 23-40.)

a polymer functionalization layer on the at least one nanostructure, (See Dai Column 5, lines 1-16 and lines 42-50 and column 6, lines 5-11 and lines 25-40.) .

The recitation, "configured to apply a selectable voltage so as to electrically influence a conductivity of the at least one nanotube" a gate electrode disposed and configured to apply a selectable voltage so as to electrically influence a conductivity of the at least one nanotube;" is taken to be not a positive limitation but only requires the ability to so perform. This recitation does not constitute a limitation in any patentable sense and therefore cannot be given patentable weight.

the layer composed and configured to alter the electrical properties of the at least one nanotube from n-type to p-type response to gate voltage, so as to permit sensing the target species by a sensing signal including current flowing

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through the conduction path under the influence of at least one selected gate voltage during exposure to the target species; is taken to be not a positive limitation but only requires the ability to so perform. This recitation does not constitute a limitation in any patentable sense and therefore cannot be given patentable weight.

The recitation, "passivation material covering at least regions in which there is electrical communication between the at least two conduction elements and the at least one nanostructure "

Dai does not specifically teach that the nanostructure sensor further comprises passivation material covering regions in which there is electrical communication between the at least two conduction elements and the at least one nanostructure. Although, Examiner takes the position that such passivation material deposited over metallization lines (electrodes) are conventional.

Gardner, drawn to chemical sensors, teaches, from fig. 1 a, the nanostructure sensor further comprising passivation material (14) covering regions in which there is electrical communication between the at least two conduction elements (17) and the at least one nano structure (17 in electrical communication CMOS or Bi-CMOS not shown in figure but described in col. 4 lines 22-29).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have the device of Dai include a passivation layer covering the electrodes of the chemical sensor as disclosed by Gardner, since this is done in .conventional semiconductor technology to protect the metallization lines from being exposed and damaged from environmental conditions. (See column 3, lines 45-65.)

With respect to claim 2, Dai teaches, from column 4, lines 23-40, that the nanostructure (20) includes carbon nanotubes.

With respect to claim 3, Dai teaches, from column 4, lines 1-10, that the nanostructure comprises a single-wall carbon nanotube (SWCNT).

With respect to claim 4, Dai teaches the nanostructure sensor wherein the at least two conducting elements (23) comprise metal electrodes. (See column 4, lines 23-40.)

With respect to claim 5, Dai teaches, from fig. 2, the nanostructure sensor wherein the at least two conducting elements (23) are in direct physical

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contact with the at least one nanostructure (20). (See column 4, lines 23-40.) With respect to claim 6, Dai teaches the nanostructure sensor wherein the polymer layer is selected to interact with the target species. (See column 5, lines 43-50 and column 6, lines 5-11 .)

With respect to claim 7, Dai teaches, from column 2, lines 28-30, the nanostructure sensor wherein the polymer layer on the at least one nanostructure (nanotube) is discontinuous (decorating).

With respect to Claim 8, Dai teaches, from column 2, lines 28-30, the nanostructure wherein the polymer layer comprises more than one material. With respect to claim 11, Dai teaches, from column 5, lines 5-16, a nanostructure sensor that comprises a gate electrode.

With respect to claim 19, Dai teaches, from figs. 1C and 3B, that the nanostructure (20) includes one or more carbon nanotubes. (See column 4, lines 41-57.)

With respect to claim 20, Dai teaches the nanostructure sensor wherein the polymer functionalization layer comprises a material providing an increase in response of the sensor to at least the target species. (See column 5, lines 43-50 and column 6, lines 5-11 .).

With respect to claim 21 Dai teaches the nanostructure sensor of Claim 1, wherein the conduction path includes a plurality of carbon nanotubes, (Dai col.4 lines 41-57) and wherein the sensing signal includes conduction under the influence of a plurality or range of gate voltages. (col. 5 lines 1 to 15 voltage range -20 to +20 volts)

3. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dai (USPN 6,528,020) and Gardner (USPN 6,111,280) as applied to claim 1 above, in view of Buckley (USPN 5,674,752).

With respect to claim 9, Dai teaches all the limitations as stated above.

Dai does not specifically teach that the target species comprises ammonia - although, ammonia is a well-known target for CNT sensors (see ref. [V], p.237) - and the polymer layer is polyethyleneimine (PEI).

However, Buckley, drawn to polymer-coated fibers for use as a chemical sensor, does teach, from fig. 10, the use of PEI as an ammonia sensor. Therefore, it would have been obvious to one of ordinary skill in the art, at the

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time of invention, to have Dai nanostructure sensor device use PEI as the polymer over-layer since this material was known to detect ammonia as disclosed by Buckley, and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

4. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dai (USPN 6,528,020) and Gardner (USPN 6,111,280) as applied to claim 1 above, in view of McGill (USPN 6,320,295).

With respect to claim 10, Dai teaches all the limitations as stated above. Dai does not specifically teach that the target species comprises hydrogen - although, hydrogen is a well-known target for CNT sensors (see ref. [V], p.237, fig. 14)- and the polymer layer is polyethyleneimine (PEI).

However, McGill, drawn to chemical sensors, does teach, from column 7, lines 15-19, the use of PEI as a hydrogen sensor.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have Dai's nanostructure sensor device use PEI as the polymer over-layer since this material was known to detect hydrogen as disclosed by McGill, and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Response to Arguments

Applicant's arguments filed on November 07, 2007 have been fully considered but they are not persuasive.

Applicants' arguments with respect to claim 1 to extent patentable weight can be given are not persuasive as all limitations are taught by the references applied as shown above.

Dependant Claims 2-10, 19-21 were alleged to be allowable because of their dependency upon alleged allowable claim 1.

However as shown above claim 1 is not allowable and therefore dependant claims 2-10 and 19-21 are also not allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **STEVEN H. RAO** whose telephone number is (571)272-1718. The examiner can normally be reached on 8.30-5.30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1714. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Steven H Rao/
Examiner, Art Unit 2814

/Howard Weiss/
Primary Examiner, Art Unit 2814